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Dated 22 January 2002

Patents Form 7/77

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Statement of inventorship and of right to grant of a patent

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference	P008792GB
2. Patent application number *(if you know it)*	0008398.0
3. Full name of the or of each applicant	SONY UNITED KINGDOM LIMITED
4. Title of the invention	DIGITAL VIDEO TAPE RECORDING
5. State how the applicant*(s)* derived the right from the inventor*(s)* to be granted a patent	BY VIRTUE OF AN ASSIGNMENT DATED 3 NOVEMBER 2000 BETWEEN OURSELVES AND THE OVERNAMED INVENTOR
6. How many, if any, additional Patents Forms 7/77 are attached to this form? *(see note (c))*	

7. **I/We believe that the person*(s)* named over the page *(and on any extra copies of this forms)* is/are the inventor*(s)* of the invention which the above patent relates to.**

Signature Date

D Young & Co

D YOUNG & CO 20 Nov 2000
Agents for the Applicants

8. Name and daytime telephone number of person to contact in the United Kingdom: 023 80634816 James Turner

Notes

a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.

b) Write answers in capital letters using black ink or you may type them.

c) If there are more than three inventor, please write the names and addresses of the other inventors on the back of another Patents Form 7/77 and attach it to this form.

d) When an application does not declare any priority, or declares priority from an earlier UK application, you must provide enough copies of this form so that the Patent Office can send one to each inventor who is not an applicant.

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D Young & Co ref: P008792GB

Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

Surname DAVID

First Names Morgan William Amos

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Patents ADP number (if you know it): GB2273420001

Surname

First Names

Address

Patents ADP number (if you know it):

Surname

First Names

Address

Patents ADP number (if you know it):

Reminder:
Have you signed the form?

Patents Form 1/77

Patent[illegible] 1977
(Rule 16)

The Patent Office

06APR00 E527469-9 D02246
P01/7700 0.00-0008398.0

D Y & CO

Request for a grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

5 APR 2000

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference — P/8792.GB

2. Patent a[illegible] — 0008398.0 — 5 APR 2000
(The Pat[illegible]

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

SONY UNITED KINGDOM LIMITED
THE HEIGHTS
BROOKLANDS
WEYBRIDGE
SURREY, KT13 0XW

Patents ADP number *(if you know it)* 6522780001

If the applicant is a corporate body, give the country/state of its incorporation — UNITED KINGDOM

4. Title of the invention — DIGITAL VIDEO TAPE RECORDING

5. Name of your agent *(if you have one)* — D YOUNG & CO

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

21 NEW FETTER LANE
LONDON
EC4A 1DA

Patents ADP number *(if you have one)* — 59006

6. If you are declaring priority from one or more earlier patent applications, give the country and date of filing of the or each of these earlier applications and (if you know it) the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day/month/year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and filing date of the earlier application

Number of earlier application	Date of filing *(day/month/year)*

8. **Is a statement of inventorship and of right to grant of a patent required in support of this request?** *(Answer 'Yes' if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

9. **Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document**

Continuation sheets of this form	0
Description	4
Claims(s)	2
Abstract	1
Drawing(s)	2+2 16

10. **If you are also filing any of the following, state how many against each item.**

Priority documents	0
Translations of priority documents	0
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	0
Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	0
Any other documents *(please specify)*	0

11. **I/We request the grant of a patent on the basis of this application.**

Signature	**Date**
D Young & Co D YOUNG & CO Agents for the Applicants	05 04 00

12. **Name and daytime telephone number of the person to contact in the United Kingdom** J A TURNER (02380) 634816

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DIGITAL VIDEO TAPE RECORDING

This invention relates to digital video tape recording.

Several formats of digital video tape have been proposed. The first commercially successful format was the so-called "D1" format, described in the book, "Introduction to the 4:2:2 Digital Video Tape Recorder", Gregory, Pentech Press, 1988. Since then there have been many other formats, either standardised or proprietary.

A feature that these formats have in common is the use of helical scanning. This is a well-established technique in which the tape medium is wrapped at least part of the way around a head drum. One or more rotating read/write heads, mounted on the head drum, sweep out successive slant tracks on the tape medium as the medium is progressed slowly past the head drum. Slant tracks may carry a timecode known in some systems as Vertical Interval Timecode (VITC). Linear tracks may also be used to carry information such as Linear Timecode (LTC), other control information, a cueing audio track and the like.

Each slant track is generally divided up into a number of regions or sectors. Although the precise number and layout of these regions varies from format to format, there are generally one or more video sectors and one or more audio sectors on each slant track. These can store compressed or uncompressed video and audio data. In other systems, data representing each video frame or image, or a group of images, may be recorded onto a group of tracks.

Recently, interest has developed in ways of recording so-called metadata along with the audio and video material. Metadata is additional or accompanying data defining the audio/video material in some fashion, and can include data items such as material identifying codes (e.g. the SMPTE Unique Material Identifier or UMID), bibliographic data such as cast or staff lists, copyright information, equipment used and so on. Of course, if any such codes are to be stored alongside the audio/video material on tape, some data capacity needs to be allocated for its storage.

One previously proposed solution is to store "small" metadata items such as material identifiers using the "user bits", that is a small amount of user-definable data within the LTC areas of the tape. Typically the user bits provide only of the order of 4 bytes (32 bits) per frame, of which some capacity is taken up by existing schemes such as "good shot markers" (GSMs). As an SMPTE UMID occupies at least 32 bytes, and in some forms up to 64 bytes, this solution provides for only a limited storage of this data.

This invention provides a digital video tape recorder operable to record video and/or audio material on successive slant tracks, storing a slant track video timecode having a plurality of user-definable data bits, and at least one linear track, storing a linear track timecode having a plurality of user-definable data bits, on a tape medium;

the digital video tape recorder being operable to store a material identifying code in the user-definable bits of the slant track video timecode and in the user-definable bits of the linear track timecode.

The invention recognises that previous attempts to store metadata along with the audio/video material on tape have suffered from a problem during "jog" or very slow motion replay of the material. In these circumstances, the LTC is unreadable because insufficient head/tape relative speed is obtained.

However, the invention recognises that a solution is not necessarily to be found simply by switching to use of the user bits in the VITC (or other slant track timecode) because these tend not to be readable during high speed replay such as shuttle operations.

Instead, embodiments of the invention provide for the material identifying code to be stored effectively twice – in the LTC and in the VITC. This provides for a reliable replay of the material identifying code across a range of replay speeds.

Further respective aspects and features of the invention are defined in the appended claims.

Embodiments of the invention will now be described with reference to the accompanying drawings, throughout which like parts are referred to by like references, and in which:

Figure 1 schematically illustrates a known tape format;

Figure 2 schematically illustrates a time code; and

Figure 3 schematically illustrates a digital camcorder.

Referring to Figure 1, a tape format is shown schematically. Video and audio information is recorded in helical tracks of which a set of, e.g. 10 or 12, tracks records one field of video. The helical tracks include vertical interval time codes (VITC). The time codes may be duplicated in a linear time code track LTC, but the contents of the VITC and LTC may be different. The tape may comprise at least one other linear track (not shown). In this illustrative description it is assumed that all video, audio and other information is recorded digitally. However, the video and audio may be recorded as analogue information. The video and audio information may be compressed according to the MPEG 2 standard for example.

The time codes are recorded once per video field. As schematically shown in Figure 2, a known time code has 80 bits of which 16 are reserved for synchronisation information, 32 for time code bits and 32 for user defined bits, herein referred to as "user bits". The user bits are interleaved with the other bits in a typical time code; however the invention is not limited to that.

The present embodiment involves the recording of locally unique material identifiers, to be referred to as MURNs (material unique reference number) in the time code user bits.

Unlike, for example, an SMPTE UMID which is a globally unique reference for a piece of material (but also takes up between 32 and 64 bytes of storage), a MURN can be much shorter – perhaps 16 bits as a typical example. The MURN has only to be unique within an individual tape. Then, in conjunction with a tape identification (perhaps written or printed on the tape, recorded in some form in the TC user bits or stored on a telefile – see below) a piece of recorded material can be identified within an organisation in order to map that material onto a globally unique UMID for later reference.

Therefore, the MURN simply needs to be a number which increments, decrements or otherwise varies from material to material on the tape. As long as the same MURN is not re-used for two pieces of material on the same tape, the local uniqueness requirement is fulfilled.

Referring to Figure 3, a camcorder 460 comprises a video and audio pickup arrangement 462 (e.g. a CCD image pickup device and a microphone) outputting data audio (A) and video (V) data streams, a MURN generator 464, a multiplexer 466 and a tape recording arrangement 468.

The MURN generator can take many forms, and serves to generate MURNs as described above. Each time the camera starts recording (i.e. at each video in-point) a new MURN is generated by the MURN generator for recording on the TC user bits relating to that piece of material.

The MURN generator operates in conjunction with a "telefile" ™ memory 470 associated with the tape medium. The telefile is a non-volatile memory device (e.g. a flash memory device) permanently attachable to the tape case 472 (e.g. a cassette) and which can be remotely interrogated – at least in a non-contact fashion – by a reader/writer 474 for example using magnetic induction for power and data transmission. The telefile stores, amongst other possible date items, a tape identifier and the highest value of MURN (on a 16 bit count) previously used.

So, when a new MURN needs to be generated, the MURN generator interrogates the telefile to find the highest previously used MURN value, increments it and uses that as the new MURN value, writing the new MURN value back to the telefile.

The MURN generated by the MURN generator is passed, with the video and audio data streams and (if used) good shot markers and the like, to the multiplexer 466 for recording on the tape.

The multiplexer arranges the MURN data and the GSM flags (and any other such data) into the time code user bits for both the LTC and the VITC. These user bits are then passed to the tape transport in a conventional way for recording on the tape. Accordingly, embodiments of the invention provide for the material identifying code to be stored effectively twice – in the LTC and in the VITC. This provides for a reliable replay of the material identifying code across a range of replay speeds from jog (single frame movement, where the VITC is more successfully read) to shuttle (where the LTC is more successfully read).

Embodiments of the invention also extend to a tape replay device arranged to recover the MURN data from either or both of the LTC and VITC. Such a device may be substantially as drawn in Figure 3, but with a demultiplexer performing the above operation in place of the multiplexer 466.

CLAIMS

1. A digital video tape recorder operable to record video and/or audio material on successive slant tracks, storing a slant track video timecode having a plurality of user-definable data bits, and at least one linear track, storing a linear track timecode having a plurality of user-definable data bits, on a tape medium;

the digital video tape recorder being operable to store a material identifying code in the user-definable bits of the slant track video timecode and in the user-definable bits of the linear track timecode.

2. A recorder according to claim 1, in which the slant track time code is a vertical interval time code (VITC).

3. A recorder according to claim 1 or claim 2, in which the material identifying code is larger than the user data bits available in a single timecode, so that each instance of the material identifying code is recorded across the user bits of time codes relating to more than one field of the video material.

4. A recorder according to any one of the preceding claims, in which the material identifying code is a code which uniquely defines the material amongst other material items stored on the same medium.

5. A video recorder according to claim 4, in which the material identifying code is an SMPTE UMID.

6. A tape format in which video and/or audio material are recorded on successive slant tracks, storing a slant track video timecode having a plurality of user-definable data bits, and at least one linear track, storing a linear track timecode having a plurality of user-definable data bits, on a tape medium; a material identifying code being recorded in the user-definable bits of the slant track video timecode and in the user-definable bits of the linear track timecode.

7. A tape medium on which video and/or audio material are recorded on successive slant tracks, storing a slant track video timecode having a plurality of user-definable data

bits, and at least one linear track, storing a linear track timecode having a plurality of user-definable data bits, on a tape medium; a material identifying code being recorded in the user-definable bits of the slant track video timecode and in the user-definable bits of the linear track timecode.

8. A digital video tape recording method comprising the steps of:

recording video and/or audio material on successive slant tracks,

storing a slant track video timecode having a plurality of user-definable data bits, and at least one linear track,

storing a linear track timecode having a plurality of user-definable data bits, on a tape medium; and

storing a material identifying code in the user-definable bits of the slant track video timecode and in the user-definable bits of the linear track timecode.

9. A digital video tape recorder substantially as hereinbefore described with reference to the accompanying drawings.

10. A tape format substantially as hereinbefore described with reference to the accompanying drawings.

11. A tape medium substantially as hereinbefore described with reference to the accompanying drawings.

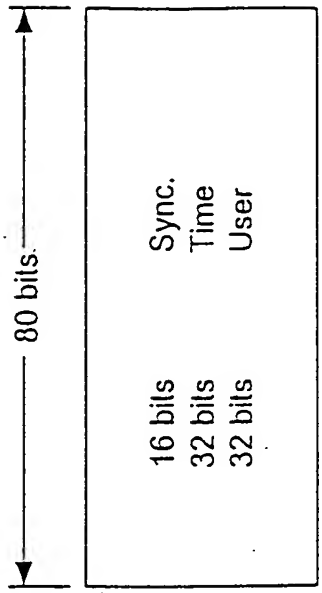
12. A digital video tape recording method substantially as hereinbefore described with reference to the accompanying drawings.

ABSTRACT

DIGITAL VIDEO TAPE RECORDING

A digital video tape recorder records video and/or audio material on successive slant tracks, storing a slant track video timecode having a plurality of user-definable data bits, and at least one linear track, storing a linear track timecode having a plurality of user-definable data bits, on a tape medium; the digital video tape recorder being operable to store a material identifying code in the user-definable bits of the slant track video timecode and in the user-definable bits of the linear track timecode.

Figure 3.



Time Code.

Fig. 2

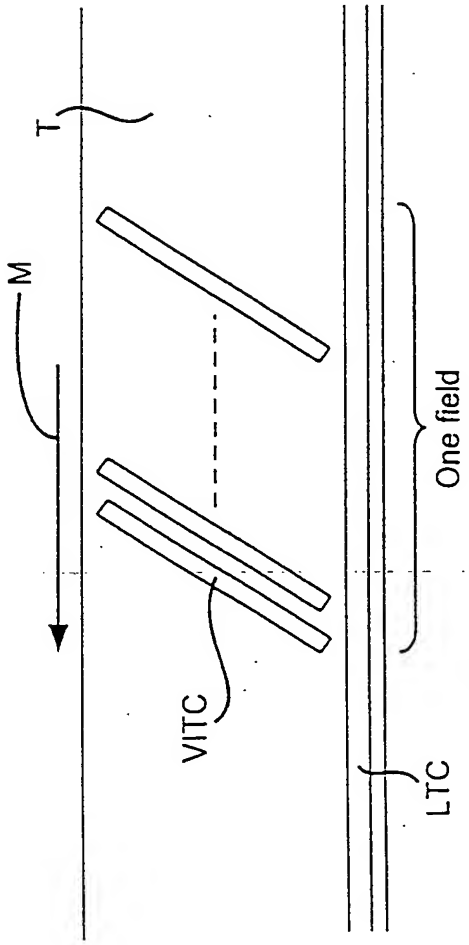


Fig. 1

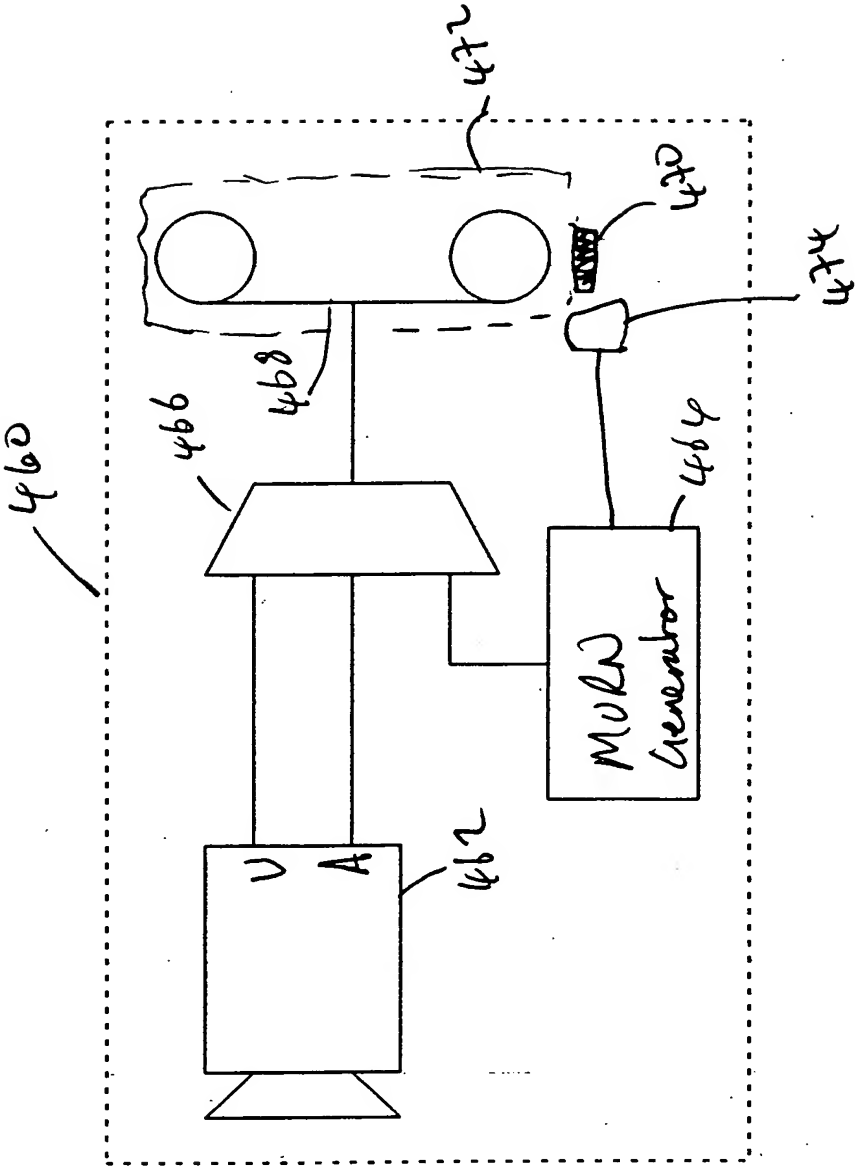


Fig. 3